Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Advanced Television Systems	)	MM Docket No. 87-268
and Their Impact Upon the Existing	)	
Television Broadcast Service	)	

COMMENTS OF ABC, INC., CBS BROADCASTING INC. AND NATIONAL BROADCASTING COMPANY, INC TO THE EX PARTE FILING OF THE ASSOCIATION OF LOCAL TELEVISION STATIONS, INC.

ABC, Inc. ("ABC"), CBS Broadcasting Inc. ("CBS") and National Broadcasting Company, Inc. ("NBC") (collectively, the "Networks") hereby submit their joint comments in response to the Commission's December 2, 1997 Public Notice, in which it invites responses to ex parte filings made in this proceeding by the Association for Maximum Service Television, Inc. ("MSTV"), et al., and the Association of Local Television Stations, Inc. ("ALTV") on November 20 and 25, respectively.

I. Introduction

The Networks reemphasize at the outset that the Commission's highest priority in this proceeding should be the speediest possible adoption of a final DTV allotment table which will allow the transition to digital broadcasting to proceed expeditiously while replicating NTSC service areas as completely as possible in the digital environment. Because of our need to stay competitive with other video service providers, and the extra costs of temporarily operating two largely duplicative broadcast systems, the Networks oppose any undue delay in either the commencement of the transition or of its completion.

These comments are limited to the ALTV ex parte filing.[1] As the Public Notice states, ALTV is concerned about "the disparity in the authorized power between the DTV channels of existing UHF stations that will operate on UHF DTV channels (U-to-U stations) and the DTV channels of existing VHF [stations] that will operate on UHF channels."[2] As discussed below, the Networks have acknowledged previously in this proceeding that this situation may indeed prove to present service reliability and indoor reception problems which should be quantified and, to the extent they are shown to exist, resolved early in the DTV transition. Indeed, work is under way to evaluate the situation, and we invite the Commission to actively monitor and contribute its expertise to this effort.[3]

However, the evaluation and solution of these signal reception problems which might be attributed to this power disparity need not, and cannot, be completed before the Commission concludes the allotment proceeding and provides the channel assignment certainty necessary to expedite the transition. It need not be completed by then because, by its terms, a decision to implement the ALTV proposal (or a variation on its theme) is independent of a decision to adopt a particular version of a DTV channel allotment table. It cannot feasibly be completed now because

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[1] The Networks believe that those improvements to the current DTV allotment table set forth in the MSTV ex parte filing (to which ABC and CBS were signatories) represent a good faith effort, based on sophisticated computer modeling, to aid the Commission in dealing with real technical problems with the current table, some of them only recently discovered. We believe that the Commission can and should seriously consider those proposed improvements in making final allotment adjustments without causing any delay in this proceeding.

[2] Public Notice at ¶2.

[3] Field tests are currently underway to establish the coverage and reliability of DTV service under real-world conditions, for both outdoor and indoor reception. These tests will confirm some of the planning factors used in the modeling upon which the allotment/assignment tables have been based. The data is being collected by the Model HDTV Station Project (WHD-TV, Washington, D.C.) and other stations, under the leadership of MSTV and others.

there is no industry consensus on the extent of the problem or on the technical and procedural features of any solution. In these comments, we will point out some features of the ALTV proposal which seem problematic on their face and others which require some further exploration. We do so not to dismiss out of hand ALTV's concerns but for the constructive purpose of informing the Commission of matters requiring some further study and in the hope that these comments will contribute to the evaluative process which is already under way.

II. The ALTV Proposal Need Not Be Acted Upon Before The Commission Adopts A Final DTV Allotment Table

In essence, ALTV's proposal would "permit DTV stations to increase power to one megawatt, provided tilt beam antennas and/or other technologies are employed to prevent any incremental interference."[4] Regardless of the merits of this particular proposal (about which we raise some questions and concerns, infra), it is clear that its intent is to improve indoor reception of the DTV signals of a U-to-U stations within its core market area by increasing their radiated power within that core without changing the overall size of their coverage areas. Indeed, ALTV emphasizes that it "does not propose changes in channel assignments" and that its proposal is "not intended to result in any increased interference above those levels that would exist under any DTV channel plan the FCC ultimately adopts."[5]

As noted above, the primary focus of the Commission at this stage of the DTV channel allotment process should be the finalization of the allotment table. We do not deny the possibility that low DTV powers initially assigned to some U-to-U stations could create reception problems

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[4] Letter from James B. Hedlund to Chairman Kennard, November 25, 1997 ("Hedlund letter), at p. 1.

[5] Id.

with some indoor antennas in some locations. Nor do we deny the possibility that tilted beam technology may hold some theoretical promise for ameliorating any such problems. Indeed, the Broadcasters Caucus stated in January 1997 that it "acknowledged and supported the ability of all stations to improve their indoor reception by increasing their overall power beyond the powers specified in the table and target such power within their current Grade A service area, provided that no interference is caused to other NTSC stations or DTV stations operating on the same or first adjacent channels."[6]

We strongly urge, however, that not enough work has yet been done to quantify the problem and to devise solutions. Under these circumstances, the Commission should conclude the allotment phase of this proceeding promptly so that the transition can proceed. It should then separately and expeditiously consider issues related to the ALTV proposal in light of both the field work that is presently under way to test digital signal propagation and indoor reception characteristics with currently available antennas, and in light of the real world experience with digital broadcast transmissions which will begin in earnest by the fall of 1998.

III. Various Technical Aspects Of The ALTV Proposal Require Further Analysis

The essence of the ALTV proposal is that the "beam" of a UHF TV antenna may be tilted below the radio horizon such that the maximum energy directed towards the radio horizon will not exceed that specified in the FCC allotment, even though the maximum power developed in the vertical plane is greater than the maximum allotment value. In a perfect world, this could be a simple and acceptable technique. However, it is not a perfect world.

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[6] Broadcasters Caucus Reply To Comments On The Sixth Notice of Proposed Rulemaking, MM Docket No. 87-268 (January 24, 1997) at 15.

Indeed, as set forth in the attached Engineering Statement of John F.X. Browne, P.E. (Exhibit A), when a typical UHF transmission scenario is evaluated, the ALTV proposal may not achieve the desired results and may also introduce some undesired effects. Issues concerning antenna performance, antenna mounting stability, propagation under anomalous conditions and close-in problems associated with extremely high field strengths must be evaluated and quantified before a determination as to the feasibility of the ALTV proposal can be made.

As explained in greater detail in Exhibit A, in order for a typical UHF DTV station which has been allotted an ERP of 50 kW at an HAAT of 300 meters to operate with 1000kW by using electrical beam tilting, the main beam of the antenna will have to be tilted to 2.5 degrees in order to achieve the relatively low field at the radio horizon.[7] As a 50 kW operation, a 2.5 degree beam tilt would direct the maximum energy (1000 kW) to points on the ground 4.3 miles from the transmitter, producing a local "field strength" of approximately 120dBu. (Approximately three times the power generated from a DTV station allotted 1000kw.) Such an effect is an undesirable and may produce receiver overload and increased multipath reflection problems.[8] Furthermore, additional study is required to assess the potential for increased interference on adjacent and "taboo" channels.[9]

In addition, because the FCC's interference assumptions are based on the maximum power radiated in the vertical plane, the effect of such factors as tower sway, antenna bending and beam steering is minimal. Stations employing tilt beam technology may have to include "margins" to

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[7] Exhibit A at 3.

[8] Id.

[9] Id. at 5-6.

account for these factors.[10] Specifically, these factors are largely dependent upon tower and antenna design parameters, but worst case assumptions easily yield total variation in the order of 1 degree. Consequently, if sufficient "margin" or "headroom" is to be provided to ensure that the relative field on the radio horizon does not exceed the target value, an additional 1 degree of beam tilt is required.[11] While protecting the radio horizon under adverse environmental conditions, this could result in a reduction of the desired power being directed towards the radio horizon when no deflection was present, thus reducing the desired coverage area. It would also result in the main beam being directed at the ground even closer to the transmitter.[12]

Lastly, there is no available data on the over-the-horizon propagation of signals where the main lobe is directed significantly below the horizon. Based on experience, it would seem that anomalous propagation conditions (such as large "k" factors, temperature inversions, ducting) could result in significant propagation beyond the radio horizon of this energy. Additional studies of these effects certainly would be required prior to adopting the beam tilting approach.[13]

In sum, there is a host of issues that require further analysis and consideration before a determination can be made as to the technical feasibility of ALTV's proposal. However, even if some accommodation could be made for use of higher power with electrical beam tilting, as set forth below, the procedures proposed by ALTV for adjudicating interferences disputes is unworkable.

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[10] Id. at 4.

[11] Id. at 5.

[12] Id.

[13] Id.

IV. The ALTV Procedure for Adjudicating Interference Disputes is Unworkable and Improperly Assigns the Burden of Proving Interference to Aggrieved Stations

In Section II of its proposal, ALTV sets forth procedures that would apply to a station that seeks to increase power above the power levels assigned to it by the FCC. ALTV's starting point is that "All DTV stations shall be permitted to commence operations at a maximum of one megawatt." A station that receives interference as a result of such a power increase could obtain relief only by filing a complaint with the FCC and satisfying the burden of demonstrating "that the visible interference it now receives exceeds the level of interference that would have existed had the DTV station operated at the power level assigned to it in the FCC's Final Report and Order." Under the ALTV proposal, the aggrieved station's proof of interference must consist of "actual field strength measurements taken by a registered professional engineering firm."

ALTV's procedural proposal is fundamentally flawed. The proposal is based on using field test measurements to determine if there is "incremental visible interference." This concept is unworkable for two reasons. First, there is no practical way to measure in the field what interference "would have existed had the station been operating at the assigned effective radiated power contained in the FCC's Final Report and Order," and thus no way to measure whether "incremental visible interference" would occur as a result of an increase in power. As the Engineering Statement points out, "defining interference as 'additional incremental interference' would lead to a highly subjective result . . . ."[14]

Second, even if an objective definition could be devised, the requirement that the aggrieved station use field tests to make its case would constitute an inordinate, if not impossible, financial and technical burden. A field test model from which reliable predictions of interference could be

[14] Exhibit A at 6.

made would entail a vast number of measurements from locations throughout the stations' service area over an extended period of time. The Engineering Statement concludes that "the variability of data from field test measurements would render this methodology virtually useless and would lead to endless debates on methodology and interpretation of data."[15] The unavoidable consequence of the ALTV plan would be to saddle the Commission with the enormous administrative burden of adjudicating interference disputes in market after market based on conflicting engineering reports.

The ALTV proposal is also problematic because it would limit interference protection to a station's DMA even though, typically, a station's service area extends well beyond its DMA. This larger area, which Nielsen reports as the Total Survey Area ("TSA"), may contain large numbers of viewers sought after by advertisers and is typically the basis upon which stations calculate their cost-per-thousand in selling advertising.

Finally, in imposing the burden of proving interference on the aggrieved station, the ALTV proposal would risk sacrificing existing service in the uncertain hope of achieving service gains based on an unproven technology. This approach is completely at odds with Commission precedent which squarely places the burden of demonstrating that a new facility will not interfere with an existing TV station on the new station. For example, under 73.525 of the Commission's rules, applicants for new or modified NCE-FM channels (which are immediately adjacent in frequency to TV Channel 6) must demonstrate to the satisfaction of the Commission, after notice to affected Channel 6 stations, that no new interference will be caused to Channel 6 stations unless the predicted interference area is de minimus (i.e., contains no more than 3,000 persons). Similarly, under 80.215 of the Commission's rules governing AMTS, the mobile maritime communications

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[15] Id.

service, coast station applicants seeking to locate within 105 miles of TV channel 13 or within 80 miles of TV channel 10 must submit a plan to the Commission to limit TV interference to the de minimus level of fewer than 100 residences. If greater interference to TV reception subsequently occurs, the coast station is required either to eliminate it within 90 days or to shut down.

V. Conclusion

For the above reasons, the Networks urge the Commission to proceed promptly to adopt a final allotment table which will best serve the most fundamental original purpose of this proceeding -- to replicate the service areas of today's NTSC television stations to the greatest extent possible in the digital environment. When that has been done, the ALTV proposal, which is not dependent on the Commission's channel allotment decision, can be evaluated on its merits with the benefit of current testing results and near-term experience of digital transmissions in various markets as the buildout begins.

Respectfully submitted,

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ENGINEERING STATEMENT

of

John F. X. Browne, P.E.

Prepared for

National Broadcasting Company

The Association of Local Television Stations (ALTV) has submitted to the Commission a proposal to permit digital television (DTV) stations operating in the UHF band to employ antenna beam-tilting techniques and other technologies in order to increase the allowable maximum effective radiated power (ERP) to 1000 kW while maintaining the power directed at the radio horizon at the authorized (allotment) value. While it is recognized that there may be issues related to the disparities between the UHF DTV power allotted to presently VHF NTSC broadcast stations vis a vis that allotted to presently UHF stations (1,000 kW vs 50 kW in many cases), it is believed that some technical aspects of the ALTV proposal require further analysis and discussion. This engineering statement sets-forth some of those issues.

Minimum Power UHF Allotments

The Commission has allotted to a large number of DTV stations a maximum allowable ERP of 50 kW as a result of its NTSC Grade B replication process. In the vast majority of these cases, the actual power needed to replicate the Grade B contour—using the Commission's assumptions—was significantly less than 50 kW; however, the Commission adopted 50 kW as the minimum power for any UHF DTV allotment.

It is possible that there will be coverage and interference issues for stations constrained to operate at 50 kW in market-places where much more powerful (1,000 kW) allotments have been made. It is also recognized that many of these stations will not be able to "maximize"

their facilities, as their allotment may already be at maximum power because of interference constraints.

Use of abnormal beam tilt may offer some relief for power increases but, as discussed below, there are several technical issues which will probably constrain the effectiveness of such a solution to power levels significantly below 1,000 kW (assuming a desired increase from 50 kW to 1000 kW). The ALTV proposal makes reference to the use of "other technologies" in addition to beam tilting, but its filing does not elaborate further as to their nature or application.

The Beam Tilting Proposal

The essence of the ALTV proposal is that the "beam", i.e., the maximum energy in the elevation pattern/vertical plane, of a UHF TV antenna may be tilted below the radio horizon such that the maximum energy directed towards the radio horizon will not exceed that specified in the FCC allotment, even though the maximum power developed in the vertical plane is greater than the maximum allotment value. In a perfect world, this could be a simple and acceptable solution. However, if a typical UHF transmission scenario is evaluated, it will appear that this approach may not fully achieve the desired results and, perhaps, introduce some undesired effects.

For the purposes of this statement, a typical station is defined as one having an antenna radiation center of 300 meters above ground and an antenna gain of 25 (13.98 dB). Assuming flat terrain, the radio horizon (4/3 earth radius) would be at a distance of 72 km (44.7 miles)[1/] and the depression angle below the horizontal to the radio horizon would be 0.48 degrees; it would not be atypical for a station to employ an electrical beam tilt of 0.5 degrees in this

[1/] If one assumes the use of a 30 ft (9 meter) receiving antenna height, the effective radio horizon would be extended accordingly.

If it is assumed that a DTV station with these characteristics has been allotted an ERP of 50 kW but wishes to operate with 1,000 kW by employing electrical beam tilting, it remains to calculate the amount of tilt required so that the assumed antenna will have the power directed at the radio horizon reduced to 50 kW or less; this is, obviously, a requirement for tilting the beam such that the relative field is 13 dB lower or 0.22 of the value previously directed at the radio horizon (1.0).

The elevation patterns of several antennas produced by different manufacturers were inspected. For an antenna having a gain of approximately 25, the width of the "main beam" is such that it would have to be tilted approximately 2.0 degrees more than the original 0.5 degrees for a total of 2.5 degrees[2/] in order to achieve this relatively low relative field at the radio horizon.

Assuming that this antenna could meet the relative field requirement of 0.22 at a beam tilt of 2.5 degrees, a maximum ERP of 1,000 kW could be employed theoretically. With this beam tilt, the maximum one megawatt energy of the main lobe would be directed at the earth's surface 4.3 miles (6.9 km) from the transmitter, producing a local "field strength"[3/] of approximately 120 dBu based on free space assumptions. This is not a desirable scenario because of potential "side-effects" such as receiver overload, and increased multipath/ reflection problems as discussed below. By way of comparison, a DTV station allotted 1,000 kW and using the same antenna/height assumptions (but with normal 0.5 degree beam tilt), would place a field at –2.5 degrees below the horizontal plane 10.5 dB lower (power reduced from 1,000 kW to approximately 89 kW) than the beam-tilted version of a 1,000 kW station; in

[2/] It is noted that some antenna patterns with large electrical beam tilt exhibit large "side lobes" above the horizontal plane that have relative field values in excess of 0.4 (only 8dB below the main lobe) and such designs would not be acceptable for this application.

[3/] Use of the term "field strength" may be inappropriate.

other words, the 50 kW allotment station would place a field 3 times stronger than the 1,000 kW allotment at this distance.

Need for Margins

Since the Commission's interference assumptions and analyses relative to distant co-channel and adjacent-channel stations are now based on the maximum power radiated in the vertical plane, it would be necessary to develop technical theses demonstrating that the power directed at the radio horizon would be an appropriate value for making such interference determinations. Assuming that this condition has been met, i.e., that use of the power at the radio horizon is the appropriate value for interference computations, it is necessary to consider the factors that might cause this value to vary and, in particular, to increase above a permissible level.

There are several factors which might cause such variations, but the principal ones seem to be:

- Variation of beam tilt (mechanical) due to tower sway
- Deflection (bending) of the antenna (top mounted cases) in high wind conditions
- Electrical beam tilt variation with frequency (sometimes referred to as "beam steering")
- Bending of top mounted antennas due to non-uniform heating effects of solar radiation

After discussions with antenna designers and manufacturers, it is clear that these variables are dependent in large measure on tower and antenna design[4/] parameters, but it is equally clear that worst case assumptions easily yield total variation in the order of 1 degree. Thus, if sufficient margin (or headroom) was to be provided to ensure that the relative field on the radio horizon never exceeded the target value, an additional 1 degree of beam tilt would be required[5/]. In the example discussed above, this would be a total beam tilt of 3.5 degrees. While protecting the radio horizon under adverse environmental conditions this, of course, could result in a reduction of the desired (50 kW, in this case) power being directed towards the radio horizon when no deflection was present thus reducing the desired coverage area. It would also result in the main beam being directed at the ground about 3.1 miles from the transmitter.

Propagation Issues

There is no available data on the over-the-horizon propagation of signals where the main lobe is directed significantly below the horizon. Intuitively, it would seem that anomalous propagation conditions (e.g., large "k" factors, temperature inversions, ducting) could result in significant propagation beyond the radio horizon of this energy. Additional studies of these effects certainly would be required prior to adopting the beam tilting approach.

Other Issues

As noted above, the ALTV proposal could result in significant increases in close-in fields (power density), and it would seem that additional study would be required to assess the

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[4/] For example, "beam steering" is related to the method used to feed the antenna elements, e.g. end-fed vs center-fed.

[5/] See footnote 2 regarding side lobes above the main lobe. It may not be possible to achieve the desired relative field under the headroom assumption.

potential for increase interference on adjacent and "taboo" channels, and for receiver overload and intermodulation due to predicted fields approaching "blanketing" levels.

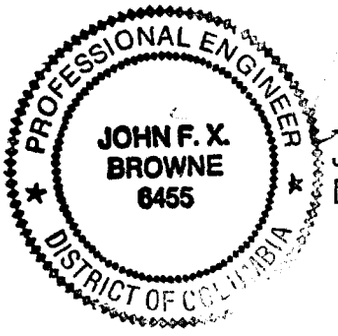
Assuming that some accommodation can be made for use of higher power with electrical beam tilting, the interference assessment and resolution procedures proposed by ALTV are inadequate. Defining interference as "additional incremental visible interference" would lead to highly subjective results; interference would have to be assessed over a suitably long time frame in order to encompass all propagation variables. Likewise, the variability of data from field strength measurements would render this methodology virtually useless and would lead to endless debates on methodology and interpretation of data. A theoretical D/U ratio as historically employed would be the only practical method for administering this aspect. Also, increasing interfering fields (DTV-DTV) may not result in a loss of a decodable signal or any visible impairment but, none-the-less, the formerly available margin would be eroded, impacting indoor reception or reception at locales not receiving a strong direct signal (i.e., lack of a suitable margin).

Conclusion

The ALTV proposal may provide a means for making modest increases in power, provided that the issues regarding antenna performance, antenna mounting stability, propagation under anomalous conditions and close-in problems associated with extremely high field strengths have been fully explored and quantified, and that sufficient margin is provided in transmission system design to accommodate normal variations in beam tilt with environmental conditions. Interference must be reliably quantifiable based on theoretical analyses which yield acceptable D/U ratios; ad hoc field measurements or subjective evaluations will not yield definitive results.

Certification

This statement was prepared by me or under my direction. All assertions contained in the statement are true of my own personal knowledge except where otherwise indicated and these latter assertions are based on information from reliable sources and are believed to be true.



John F.X. Browne, P.E.
December 4, 1997